

Amendments to the Drawings :

The attached sheets of drawings include changes to Figs. 4 and 6. These sheets, which include Fig. 4 and 6, replace the original sheets including Figs. 4 and 5 6. In Figs. 4 and 6, referral numbers 111, 112, 113 and 211, 212, 213 have been added, respectively.

Attachment: Replacement Sheet

2 pages

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REMARKS/ARGUMENTS**1. Request for Continued Examination:**

Applicants respectfully request continued examination of the
5 above-indicated application as per 37 CFR 1.114.

Claims 1-20 are pending, wherein claims 1 and 13 are currently amended
according to Figs. 4 and 6.

Paragraphs 26 and 30 are amended according to Figs. 4 and 6.

10 Figs. 4 and 6 are amended to add referral numbers.

No new matter has been introduced.

2. Rejection of claims 1-2, 4, 7-20 under 35 U.S.C. 102(b):

Claims 1-2, 4, 7-20 are rejected under 35 U.S.C. 102(b) as being
15 anticipated by US Patent No. 6,388,736 to Smith et al. (hereinafter referred to
as Smith) for reasons of record.

Response:

20 Claims 1 and 13 are currently amended according to Figs. 4 and 6 for more
clear definition. The present application relates to a lithography method for
forming a plurality of patterns in a photoresist layer on a substrate. In the method,
a phase shift mask is employed for forming the patterns in the photoresist layer.
The patterns formed in the photoresist layer are corresponding to the transparent
25 main features of the phase shift mask (PSM). The PSM comprises a plurality of
transparent main features, a plurality of first phase shift transparent regions, and a
plurality of second phase shift transparent regions. The layout for the transparent
main features, the first phase shift transparent regions, and the second phase shift
transparent regions is designed in a way described as follows. The transparent
30 main features each are surrounded by the first phase shift transparent regions and
the second phase shift transparent regions in a way, referring to Figs. 4 and 6, that

the first phase shift transparent regions 104 and the second phase shift transparent regions 106 are interlaced contiguously along a periphery of one of the transparent main features 102, any two contiguous first phase shift transparent region 104 and second phase shift transparent region 106 share a common side 111. **One end of**
5 **the common side is located at or on the periphery of the transparent main features.** Both of the any two contiguous first phase shift transparent region and second phase shift transparent region each have another side (112 and 113, respectively) adjacent to the common side 111 and **these another sides (112 and 113) are located at or on the periphery of the transparent main feature.** Each
10 of the first phase shift transparent regions has a phase shift relative to each of the second phase shift transparent regions.

In such layout for the PSM, referring to Para [0014] and Para [0026] of the specification of the present application, the contrast and the resolution of the
15 resulting patterns formed in the photoresist layer corresponding to the transparent main features can be improved. The waveforms produced by light passing through **the transparent main features and the contrast enhanced features** cancel each other out to increase the contrast of the aerial image and to improve the resolution of the patterns formed corresponding to the transparent main features.
20 At the same time, the waveforms produced by light passing through **the assistant features and the contrast enhanced features** cancel each other out to eliminate the light leakage problem occurring in the periphery of the patterns. The light leakage problem frequently occurs in the prior art. For example, as described in the embodiment of the present application, the first phase shift transparent regions
25 104 serve as the assistant features to have a phase shift of 0 degrees relative to the transparent main features 102, and the second phase shift transparent regions 106 serve as the contrast enhanced features to have a phase shift of 180 degrees relative to the transparent main features 102. Consequently, the contrast of the aerial image is increased to improve the contrast and resolution of the patterns 114. In
30 addition, in the present application, the conventional exposure, develop, and bake processes are conveniently utilized without changing these processes, and the patterns formed corresponding to the main transparent features can be contact hole

patterns, other dense patterns, metal line patterns, or island structure patterns, not limited to line patterns.

5 The examiner deems that Smith et al. patent (6,388,736) teaches, in column 3, line 45 to column 4, line 20, that a phase shifting mask with a transparent phase shift layer having phase shift features patterned on it, and these patterns can be interpreted as the transparent main features, and the features also phase shift each other, and therefore qualify as interlaced first and second phase shift transparent regions. The examiner also deems that Smith et al. teach, in column 3, lines 10 55-57, as well as in column 4, lines 9-15, that two phase shifting boundaries or edges are in close proximity to each other, which can be read as having ends that are substantially touching each other and the main features.

15 However, in the present application, it is the case that "a plurality of first phase shift transparent regions 104 and a plurality of second phase shift transparent regions 106 interlace each other" and "the interlaced first phase shift transparent regions and second phase shift transparent regions surround a main transparent feature", but not the case as taught by Smith et al. that the transparent main features being qualified as first and second phase shift transparent regions interlace, 20 which lacks the layout of a main transparent surrounded by a plurality of first and second phase shift transparent regions. In the present application, there are three members on the PSM. The PSM taught by Smith et al. includes only two members.

25 Furthermore, as described in the currently amended claims 1 and 13, the main transparent feature is surrounded by the first and second phase shift transparent regions in such a way that, referring to Fig. 4, two contiguous first phase shift transparent region 104 and second phase shift transparent region 106 share a common side 111. One end of the common side 111 is located at or on the 30 periphery of the transparent main features 102. The first phase shift transparent region 104 and the second phase shift transparent region 106 each have another sides 112 and 113 respectively adjacent to the common side 111, and these sides

112 and 113 are located at or on the periphery of the transparent main feature 102.

The Examiner deems that "two phase shifting boundaries or edges are in close proximity to each other, which can be broadly read as having ends that are substantially touching each other and the main features" are doubtful, because
5 "two edges are in close proximity to each other" should be different from "touching". Even if it can be broadly read as having ends that are substantially touching each other, it is the situation that two edges of two adjacent pairs of two phase shifting regions (all in an about parallel direction) touch each other, but there
10 is not any main transparent feature for the ends of both the edges to touch. Moreover, the phase shift regions having closed boundaries have not a side other than the closed boundaries to touch the periphery of a same main transparent feature. Therefore, the PSM disclosed by Smith et al. cannot be interpreted to have the orientation and layout as the PSM presented in the present application.

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In addition, Smith et al. form the patterns corresponding to the closed boundaries on the photoresist layer and the patterns are lines. Using the method of the present application, contact hole patterns, other dense patterns, metal line patterns, or island structure patterns can be suitably formed with accordance to the
20 shape of the main transparent feature. The masks disclosed by Smith et al. and disclosed in the present application are different.

Therefore, Smith et al. did not teach claims 1 and 13 of the present application. Claims 1 and 13 should be allowable over Smith et al..
25 Reconsideration of claims 1 and 13 is hereby respectfully requested.

As claims 2, 4, 7-12 and 14-20 are dependent on claims 1 and 13, respectively, they should be allowed if claims 1 and 13 are allowed. Therefore, reconsideration of claims 2, 4, 7-12 and 14-20 is politely requested.

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3. Rejection of claims 3, 5-6 under 35 U.S.C. 103(a):

Claims 3, 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable

over U.S. Patent No. 6,388,736 (Smith et al.) in view of U.S. Patent Application Publication No. 2004/0013948 (Lin et al.) for reasons of record.

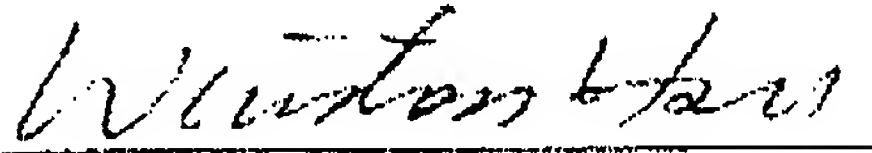
Response:

5 Claims 3, and 5-6 of the present application are based on claim 1 and further restricted to the photoresist layer as a positive photoresist layer or a negative photoresist layer or the pattern comprising a metal line pattern or an island pattern. Since the currently amended claim 1 is not disclosed, taught, or suggested by Smith et al. as the reason described above, claims 3, and 5-6 will not
10 be obvious from Smith in view of Lin. Therefore, reconsideration of claims 3, and 5-6 is hereby respectfully requested.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

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Sincerely yours,



Date: 12.08.2006

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